17. (Amended) A control system for measuring a gap as set forth in claim 16, further including:

a seal mounted to the distal end of at least one of the leading or trailing arms, the seal having a face for bearing against one of said belt and said felt; and

at least one of the transducers mounted in the face bearing against one of said belt and said felt.

REMARKS

Claims 1-17 are pending in this application. Claims 1-17 are rejected, and claims 1, 2, 4-8, 10-12 and 15-17 are objected to in this application. Claims 1, 4, 5, 7, 8, 10, 12 and 14-17 are amended hereby.

Responsive to the Examiners objections in paragraphs 1-6 of the Office Action to the specification, drawings and claims, Applicants have amended the specification, drawings and claims to overcome the objections of the Examiner and respectfully submit that the specifications, drawings and claims are now in condition for allowance.

Responsive to the rejection of claims 4 and 12-14 under 35 U.S.C. § 112, first paragraph, Applicants have amended claims 4, 12 and 14, keeping in mind the comments offered by the Examiner. Applicants submit that the claimed elements of the system, sensor or transducer 22, seal 18, arm 15, press apparatus 10, support rolls 16 or 46 and controlled deflection roll 44, and the connective relationships therebetween are all disclosed in the specification as amended and shown in the drawings as amended (Figs. 1-3). Claim 12 has been amended in independent form to eliminate the connection between frame 12 and controlled deflection roll 44 or support roll 46. Thus, for all of the foregoing reasons, Applicants submit that claims 4 and 12-14 are supported

by the specification so as to enable one skilled in the art to make and use Applicants' invention and thus claims 4 and 12-14 are in allowable form.

Responsive to the rejection of claims 12-14 under 35 U.S.C. § 112, second paragraph, Applicants have amended claims 12 and 14, keeping in mind the comments offered by the Examiner. Claim 12 has been amended in independent form to eliminate the connection between frame 12 and controlled deflection roll 44 or support roll 46. Claims 13 and 14 depend from claim 12 and include all the limitations of claim 12. Thus, for all of the foregoing reasons, Applicants respectfully submit that claims 12-14 are definite and do particularly point out and distinctly claim the subject matter which the Applicants regard as the invention and are thus in allowable form.

Responsive to the rejection of claims 1-11, 16 and 17 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 6,306,258 (Lange et al.) in view of U.S Patent 5,953,230 (Moore), Applicants respectfully traverse this rejection of claims 1-11, 16 and 17 and submit that claims 1-11, 16 and 17 are now in condition for allowance.

Lange et al. disclose air press 20 (Fig. 1) positioned about upper forming fabric 22 and lower forming fabric 24 and web 26 positioned therebetween. Air press 20 includes pressure box 28 positioned above upper forming fabric 22 and vacuum box 30 positioned below lower forming fabric 24. Pressure box 28 includes rigidly mounted frame 32 and open-sided box 34. The loading of ceramic shoes 53, 54 and the movement of inner box 34 is controlled by pairs of opposed air tubes. Upper air tubes 62, 64 move baffles 36, 38 downwardly by expanding from upwardly facing surfaces 66, 68 of short legs 55, 56. Lower air tubes 65, 67 move baffles 36, 38 upwardly away from forming fabrics 22, 24 by expanding between portions 70, 72 of frame 32 and downwardly facing surfaces 74, 76 of short legs 55, 56 of baffles 36, 38. Upper air tubes 62,

64 and lower air tubes 65, 67 are connected to a source of compressed air (not shown) and a controller (not shown) with which baffles 36, 38 are pressed against upper forming fabric 22. In an alternative embodiment air press 128 employs vacuum roll 120 (column 3, line 48 through column 6, line 17).

Moore discloses sensing system 1 (Fig. 1) for measuring the pressure distribution and nip width in a nip roll press of a papermaking machine. Rolls 5 and 6 rotatingly squeeze a fibrous web, which is carried on felt 8 and is disposed therebetween. Sensing system 1 includes strip 2 with sensors 4 fixed to strip 2 for sensing pressure/force and/or nip width. Electronics 10 are in communication with multiplexer 12, which is accessed by bi-directional transmitter 14. Multiplexer 12 cycles through sensors 4 to obtain pressure signals from sensor locations along strip 2, and thus along roll 5, in the nip press. Control system 22 can be connected to computer 18 or signal conditioner 16 to correct any sensed pressure irregularities, by increasing or decreasing the degree of contact between rolls 5, 6. Control system 22 has internal computer 26 for receiving user inputs in response to interpretation of pressure sensed, or for receiving direct pressure readings from the signal conditioner 16. Computer 26, upon receipt of such signals initiates corrective measures to adjust the force being applied by roll 5. Strip 2 is removably attached to roll 5 (column 3, line 57 through column 5, line 32). Importantly, and as stated in column 4, lines 1-11, strip 2 must lie in the nip, **between** roll 5 and the felt 8 or directly **between** rolls 5 and 6. Referring to Fig. 1, it is obvious to one of ordinary skill in the art that the nip width sensing system of Moore cannot be used during operation of a roll press because the strip would interfere with and obstruct the paper web. Additionally, considering the rotational motion of roll 5 during operation, if strip 2 was used during operation coil 15 would flail about and do violence to

equipment, the paper web and persons nearby. Therefore, strip 2 is not used during the operation of rolls 5 and 6, rather sensing system 1 is only used during a setup operation for rolls 5 and 6.

In contrast, claim 1 as amended recites in part, "a sensor mounted in one of the press apparatus or support ..." (Emphasis added). Applicants submit that such an invention is neither taught, disclosed nor suggested by Lange et. al. and Moore or any of the other cited references, and includes distinct advantages thereover.

Lange et al teaches an air press and a controller and Moore teaches a sensing system useful to setup a set of rolls and which is removed prior to operation of the rolls. However, Lange et al and Moore, separately or in combination, fail to disclose, teach or suggest a sensor mounted in one of the press apparatus or support.

Applicants' invention has an advantage over the cited references in that there is continuous control of the gap during press apparatus operation. Another advantage is that the sensors are not subject to removal before press apparatus operation. Yet another advantage is that the control system for gap measuring of the present invention can be used during both the press apparatus operation and setup versus only during setup.

For the foregoing reasons, Applicants submit that no combination of the cited references teaches, discloses or suggests the subject matter of claim 1. Claim 1 and claims 2-11 depending therefrom, are therefore in condition for allowance, and Applicants respectfully request withdrawal of all rejections and allowance thereof.

In further contrast, claim 16, as amended, recites in part, "a sensor attached to at least one of the leading or trailing arms ..." (Emphasis added). Applicants submit that such an invention is neither taught, disclosed nor suggested by Lange et. al. and Moore or any of the other cited references, and includes distinct advantages thereover.

Lange et al teaches an air press and a controller and Moore teaches a sensing system useful to setup a set of rolls and which is removed prior to operation of the rolls. However, Lange et al and Moore, separately or in combination fail to disclose, teach or suggest a sensor attached to at least one of the leading or trailing arms.

Applicants' invention has an advantage over the cited references in that there is continuous control of the gap during press apparatus operation. Another advantage is that the sensors are not subject to removal before press apparatus operation. Yet another advantage is that the control system for gap measuring of the present invention can be used during both the press apparatus operation and setup versus only during setup.

For the foregoing reasons, Applicants submit that no combination of the cited references teaches, discloses or suggests the subject matter of claim 16. Claim 16 and claim 17 depending therefrom, are therefore in condition for allowance, and Applicants respectfully request withdrawal of all rejections and allowance thereof.

Responsive to the rejection of claim 15 under 35 U.S.C. § 103(a) as being unpatentable over Moore in view of Lange et al., Applicants have amended claim 15 and submit that claim 15 is now in condition for allowance.

In contrast, claim 15 as amended recites in part, a plurality of transducers mounted in the support roll surface . . ." (Emphasis added). Applicants submit that such an invention is neither taught, disclosed nor suggested by Lange et. al. and Moore or any of the other cited references, and includes distinct advantages thereover.

Lange et al teaches an air press and a controller and Moore teaches a sensing system useful to setup a set of rolls and which is removed prior to operation of the rolls. However, Lange et al

and Moore, separately or in combination fail to disclose, teach or suggest a plurality of transducers mounted in the support roll surface.

Applicants' invention has an advantage over the cited references in that there is continuous control of the gap during press apparatus operation. Another advantage is that the sensors are not subject to removal before press apparatus operation. Yet another advantage is that the control system for gap measuring of the present invention can be used during both the press apparatus operation and setup versus only during setup.

For the foregoing reasons, Applicants submit that no combination of the cited references teaches, discloses or suggests the subject matter of claim 15. Claim 15 is therefore in condition for allowance, and Applicants respectfully request withdrawal of all rejections and the allowance thereof.

For the foregoing reasons, Applicants submit that the pending claims are definite and do particularly point out and distinctly claim the subject matter which Applicants regard as the invention. Moreover, Applicants submit that no combination of the cited references teaches, discloses or suggests the subject matter of the amended claims. The pending claims are therefore in condition for allowance, and Applicants respectfully request withdrawal of all rejections and allowance of the claims.

In the event Applicants have overlooked the need for an extension of time, an additional extension of time, payment of fee, or additional payment of fee, Applicants hereby conditionally petition therefor and authorizes that any charges be made to Deposit Account No. 20-0095, TAYLOR & AUST, P.C.

Should any question concerning any of the foregoing arise, the Examiner is invited to telephone the undersigned at (260) 897-3400.

Respectfully submitted,

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I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, Washington, DC 20231, on: May 28, 2002.

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May 28, 2002
Date

Title: CONTROL SYSTEM FOR GAP MEASURING
Application Serial No.: 09/713,434 Group: 2859 Examiner: M. Jagan



**ATTACHMENT A:**
**MARKED-UP COPY SHOWING AMENDMENTS**

COPY OF PAPERS
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IN THE SPECIFICATION

Specification paragraph beginning on page 5, line 18:

With further reference to Fig. 1A, there is a gap G between the curved surfaces 17, 19 of support roll 16 and seals 18, 18A, respectively. At the location of pressure transducer [2] 22, gap G is measured normal to planes PB, PF tangent to the outer curved surface of belt B against seal 18 or 18A and tangent to the surface of felt F against support roll 16.

Specification paragraph beginning on page 4, line 10:

Referring now to the drawings, as shown in Figs. 1 and 1A, a traveling composite web W is guided over a guide roll 8 to begin its processing in an air press apparatus 10, and subsequently over guide roll 8A.

Specification paragraph beginning on page 7, line 7:

The air pressure in actuators in the form of flexible tubes 36 on pressure body 14 produces a nip pressure against the paper web P in gap G. This seals the air pressure in chamber [32] 20 against modification of the air pressure from an air source 38 to tubes 36 to increase, decrease or maintain the desired nip load and corresponding gap G. Gap G is measured by the pressure on transducer 22 which in turn signals controller 32 to control the air pressure from air source 38, acting in tubes 36.

Specification paragraph beginning on page 7, line 20:

Control of the measured gap or nip at corresponding cross-machine locations along the length of the roll faces is accomplished by the controller signaling actuators in the form of

individual shoes 54a .. 54i via lines 39a-39i within controlled deflection roll 44 to provide increased or decreased shoe actuation pressure against inside surface 56 of hollow cylindrical roll shell 52 of controlled deflection roll 44. This action adjusts gap G at one or more locations along the longitudinal working length of the nipped rolls 44, 46, as desired, according to the corresponding gap measurements. Such control of the measurement of gap G also affords corresponding control of the nip load against the composite web W and paper web P to provide the stated advantages as well as other advantages readily discernable by those skilled in the art.

Specification paragraph beginning on page 6, line 6:

Another embodiment is shown in Figs. 2 and 3. In this embodiment, the frame includes the center shaft 42 of a so-called controlled deflection roll 44 which serves as the pressure roll in a nipped-roll couple. A support roll 46 forms a gap G with roll 44 when rolls 44, 46 are engaged along a nip line of contact N as shown in Fig. 2. Support roll 46 has a plurality of sensors in the form of transducers 22a...22e mounted in its surface. Both rolls 44, 46 have journals 48, 50, respectively, about which the hollow, cylindrical roll shell 52 of the controlled deflection roll, and support roll 16 rotate.

Specification paragraph beginning on page 4, line 19:

Seals 18, 18a define, with the pressure body 14 (including the lateral sides thereof) and composite web W, a pressure chamber 20. The composite web W is formed of a flexible belt B, the flexible felt F with a nascent paper web P disposed in between. The belt B is positioned to be between the paper web P and curved surfaces 19, 19a of the seals to prevent abrasion between the seal surfaces and the paper web as the composite web W passes through the nip N1, N2 between each respective seal 18, 18A. An optional water shower 6 provides lubrication between belt B and the curved surface of seals 18 and 18A. In an alternative embodiment the positions of felt F

and belt B are transposed.

IN THE CLAIMS

1. (Amended) A control system for measuring a gap in an apparatus for pressing a traveling paper web, comprising:

a support and a press apparatus, [and a] said press apparatus including a pressure body, said pressure body and said support defining the gap therebetween;

a frame movably supporting the press apparatus; Pressure body

an actuator operatively disposed between the frame and ~~press apparatus~~ pressure body for selectively moving the press apparatus toward and away from the support to control the gap size;

a sensor mounted in one of the press apparatus or support for producing a signal indicative of the pressure on the paper web as the paper web [and the at least one belt or felt are] is passed through the gap [beneath the] adjacent said sensor; and

a controller operatively linked with the sensor for receiving the signal, determining the measure of the gap as a function of the pressure, and causing the actuator to move the press apparatus to control the gap size.

4. (Amended) A control system for measuring a gap as set forth in claim [2] 3, wherein the ~~press apparatus~~ Pressure body includes leading and trailing arms; a seal is mounted on a distal end of at least one of the leading or trailing arms for contacting [the at least] one of a belt [or] and a felt in nipping engagement therewith; and a transducer is mounted in the seal of at least one of the leading or trailing arms for producing signals indicative of the gap between the press apparatus and the support.

5. (Amended) A control system for measuring a gap as set forth in claim 1, wherein the support [means] comprises a rotatable support roll having a cylindrical support surface; and the

press apparatus includes a seal which has an outer surface contoured to substantially conform with the support surface of the support roll.

7. (Amended) A control system for measuring a gap as set forth in claim 6, wherein the press apparatus includes a seal for contacting [the at least] one of a belt [or] and a felt in nipping engagement therewith.

8. (Amended) A control system for measuring a gap as set forth in claim 7, wherein the seal has an outer surface for engaging [the at least] one of the belt [or] and the felt, the seal outer surface being contoured to conform with the support.

10. (Amended) A control system for measuring a gap as set forth in claim 1, wherein the paper web is disposed to travel between a belt and a felt; the support [means] comprises a support roll having a roll surface; the press apparatus includes a seal having a surface curved for engaging the belt over the support roll surface; and the sensor includes a transducer operatively mounted in the seal curved surface for engaging the belt and producing a signal indicative of the gap between the seal surface and the support roll surface as the belt, paper web and felt are passed therebetween.

12. (Amended) A control system for measuring a gap [as set forth in claim 1] in an apparatus for pressing a traveling paper web, [wherein] comprising:

[the press apparatus includes] a controlled deflection roll having a center [support] shaft and a hollow cylindrical roll shell rotatably disposed about the support shaft and at least one pressure shoe mounted on the center shaft for supporting and applying pressure to the roll shell against the inner cylindrical surface thereof [for providing pressure between the support shaft and the roll shell for modifying the gap by controlling the deflection of the cylindrical roll shell];

[the] a support [means] includes a support roll having a cylindrical support roll surface for

supporting the paper web, [and the at least one belt or felt thereon] said support roll and said controlled deflection roll defining the gap therebetween; [and]

[the] a sensor includes at least one transducer mounted in the support roll surface[.]; and

a controller operatively linked with the sensor for receiving the signal, determining the measure of the gap as a function of the pressure, and causing an actuator to move the controlled deflection roll to control the gap size.

14. (Amended) A control system for measuring a gap as set forth in claim 12, wherein:

the at least one pressure shoe is operatively linked with the controller;

the sensor comprises a plurality of transducers mounted in spaced array longitudinally along the length of the support roll surface; each said sensor operatively linked with said controller, whereby signals from the specific ones of the transducers result in changes in force supplied to a corresponding pressure shoe to modify the measured gap at a specific location along [the] a pressure nip line of contact between the controlled deflection and support rolls[, as desired].

15. (Amended) A control system for measuring a gap and apparatus for pressing a [composite web comprising a] paper web [disposed between a co-traveling belt or felt on either side of the web] as the [composite] paper web travels through the gap, the apparatus comprising:

a controller;

a pressure source;

a controlled deflection roll having a center shaft and a hollow cylindrical roll shell disposed for rotation about the center shaft, the controlled deflection roll further having a plurality of end-aligned shoes mounted on the center shaft for supporting and applying pressure to the roll shell against the inner cylindrical surface thereof;

a support roll mounted in opposed array with the controlled deflection roll such that the gap is formed between the controlled deflection and support rolls as the composite web is passed in the nip therebetween;

a plurality of transducers mounted in the support roll surface for measuring the gap beneath each transducer, each of the transducers linked to the controller to provide signals indicative of the gap [over] adjacent a specific transducer;

the pressure source is operatively linked to individual shoes for providing power to move the shoes relative to the center shaft;

the controller is operatively linked with the pressure source to actuate individual shoes responsive to signals received from corresponding transducers indicative of gap measurement at a corresponding location along the nip between the controlled deflection roll and support roll.

16. (Amended) A control system for measuring a gap in an apparatus for pressing a traveling paper web [disposed between a co-traveling belt and felt on either side thereof] as the paper web[, belt and felt travel] travels through the gap, the apparatus including [press apparatus and] a support and a press apparatus, said press apparatus including a pressure body, said pressure body and said support defining the gap therebetween, comprising:

a frame for movably supporting the press apparatus;

the support includes a roll having a cylindrical surface;

the press apparatus includes an air pressure chamber having leading and trailing arms disposed to engage one of [the] a belt or a felt to seal the air pressure chamber thereagainst;

a pressure source for providing pressurized air to the air pressure chamber for providing pressing force to the web as the web passes beneath the air pressure chamber over the support roll surface;

a sensor attached to at least one of the leading or trailing arms at the interface between the at least one arm and the felt or belt over the surface of the roll for producing a signal indicative of the pressure on the paper web as the paper web is passed [over the transducer] proximate to said sensor; and

a controller operatively linked with said pressure source and with the at least one sensor for receiving the signal, measuring the gap and selectively causing increasing or decreasing pressure on the press apparatus to control the gap.

17. (Amended) A control system for measuring a gap as set forth in claim 16, further including:

a seal mounted to the distal end of at least one of the leading or trailing arms, the seal having a face for bearing against [the] one of said belt [or] and said felt; and

at least one of the transducers mounted in the face bearing against one of said belt [or] and said felt.